Amendments to the Claims

The following listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims

Claims 1-5 (Canceled)

6. (Currently amended) A reticle transfer system that is adapted for transferring reticles used in integrated circuit ("IC") fabrication between reticle cassettes and/or reticle holders having differing configurations, each reticle cassette or reticle holder being respectively carried within a sealed Standard Mechanical InterFace ("SMIF") pod that is adapted for receiving and holding a reticle cassette or reticle holder having a particular configuration, each reticle cassette or reticle holder enclosed respectively within a sealed SMIF pod carrying at least one reticle, ~~The~~ the SMIF pods~~, which pod openers included in the reticle transfer system of claim 5 are adapted to receive, include~~ including a cassette-type encoder formed by a block of material that is pierced by at least one hole to thereby establish a unique, machine-readable code for specifying a particular type of reticle cassette or reticle holder that the SMIF pod is adapted to receive

and hold, the cassette-type encoder being affixed to a base of the SMIF pod, ~~and wherein~~

the reticle transfer system ~~of claim 5~~ comprising:

a. at least two SMIF pod openers that are respectively adapted for:

i. receiving a sealed SMIF pod which carries either a reticle cassette or a reticle holder; and

ii. opening the SMIF pod thereby exposing either a reticle cassette or a reticle holder carried therein together with a reticle carried thereby to a controlled environment maintained within the reticle transfer system; and

b. a robotic arm mechanism which includes an end effector that is adapted for supporting and clamping a reticle, the end effector including:

i. a reticle-support blade that is secured to, supported by and projects outward from the robotic arm mechanism for effecting an automatic transfer of a reticle between a pair of reticle cassettes and/or reticle holders; and

ii. a front gripper secured to an end of the reticle-support blade which is furthest from the robotic arm mechanism, and that the robotic arm mechanism, when

effecting an automatic transfer of a reticle between a pair of reticle cassettes and/or reticle holders, disposes to receive an edge of the reticle that is located furthest from the robotic arm mechanism, and wherein the front gripper of the end effector is divided into two halves which are respectively secured to the end of the reticle-support blade on opposite sides of a notch that pierces the end of the reticle-support blade furthest from the robotic arm mechanism; ~~and~~

c. the robotic arm mechanism at various times being positionable within the reticle transfer system adjacent to an opened SMIF pod that is present within either of the pod openers for:

i. inserting the end effector toward the exposed reticle cassette or reticle holder for supporting and clamping a reticle carried thereby, and to withdraw the reticle from the reticle cassette or reticle holder into the controlled environment maintained within the reticle transfer system; and

ii. inserting the end effector having a reticle supported by and clamped thereto from the controlled environment maintained within the reticle transfer system toward the exposed reticle cassette or reticle holder to

deposit the reticle in the reticle cassette or reticle holder;

whereby the reticle transfer system effects automatic transfer of reticles through the controlled environment maintained within the reticle transfer system between a pair of reticle cassettes and/or reticle holders; and

d. the end effector further ~~includes~~ including a thru-beam sensor which, when the reticle transfer system ~~ascertains~~ is ascertaining which particular type of reticle cassette or reticle holder the SMIF pod carries~~:~~, passes a beam of light across the notch that pierces the end of the reticle-support blade furthest from the robotic arm mechanism~~; and~~ when the robotic arm mechanism positions the end effector so the beam of light may pass through holes that pierce the block of material.

7. (Currently amended) The reticle transfer system of claim ~~5~~ 6 wherein the end effector further includes a rear gripper that is located on the reticle-support blade between the front gripper and the robotic arm mechanism, the rear gripper being urgeable horizontally along the reticle-support blade toward the front gripper to engage an edge of the reticle which is furthest from the front gripper when the end effector clamps a reticle thereto.

8. (Previously presented) The reticle transfer system of claim 7 wherein the rear gripper of the end effector includes a vacuum port that is adapted for engaging the edge of the reticle which is furthest from the front gripper to form a vacuum chuck therewith which, during withdrawal of the reticle from the reticle cassette or reticle holder into the controlled environment maintained within the reticle transfer system, secures the reticle to the end effector.

9. (Currently amended) The reticle transfer system of claim ~~5~~ 6 wherein the end effector further includes a pair of moveable side grippers that are located on the reticle-support blade between the front gripper and the robotic arm mechanism, the side gripper being adapted for closing toward each other to respectively engage opposite side edges of the reticle thereby both clamping the reticle to the end effector and restraining the reticle from moving horizontally with respect to the reticle-support blade.

10. (Currently amended) The reticle transfer system of claim ~~1~~ 6 further comprising a reticle reorienter adapted for use in automatically exchanging reticles between a reticle carrier located

in the reticle reorienter and a reticle cassette or a reticle holder located in one of the pod openers.

11. (Previously presented) The reticle transfer system of claim 10 wherein the reticle reorienter further re-orients reticles between a vertical orientation of reticles present in a reticle carrier and a horizontal orientation of reticles carried either by a reticle cassette or by a reticle holder located in one of the pod openers.

12. (Previously presented) The reticle transfer system of claim 11 wherein the reticle reorienter is a tilt station which is adapted for directly receiving the reticle carrier after removal from a reticle-shipping container, when the tilt station initially receives the reticle carrier reticles present therein are oriented vertically.

13. (Previously presented) The reticle transfer system of claim 11 wherein the reticle reorienter is a box-opening station which is adapted for directly receiving a reticle-shipping container which includes an outer box in which rests a reticle carrier that receives reticles, the reticle carrier and reticles carried thereby being covered by a box cover which mates with and

seals the outer box; when the box-opening station initially receives the reticle-shipping container, reticles present in the reticle carrier contained in the reticle-shipping container are oriented vertically; the box-opening station being further adapted for removing the box cover to thereby expose both the reticle carrier and reticles carried by the reticle carrier.

14. (Previously presented) The reticle transfer system of claim 13 wherein a reticle-shipping container received by the box-opening station includes a registration tag for indicating the orientation of the reticle carrier enclosed therein, and the box-opening station includes an orientation probe for ascertaining the orientation of a reticle-shipping container received by the box-opening station.

15. (Previously presented) The reticle transfer system of claim 13 wherein the box-opening station further includes least one box clamp for locking the outer box and the reticle carrier to the box-opening station while the box cover is removed therefrom.

16. (Previously presented) The reticle transfer system of claim 13 wherein the box-opening station further includes a rotary table that receives a reticle-shipping container and is adapted for

rotating the reticle-shipping container about an axis that is disposed parallel to reticles carried in the reticle carrier enclosed within the reticle-shipping container.

Claims 17-18 (Canceled)

19. (New) The reticle transfer system of claim 6 wherein the end effector includes a reticle-presence detector that is adapted for use in ascertaining a location where the reticle cassette or reticle holder actually carries a reticle.

20. (New) A reticle transfer system that is adapted for transferring reticles used in IC fabrication between reticle cassettes and/or reticle holders having differing configurations, each reticle cassette or reticle holder being respectively carried within a sealed SMIF pod that is adapted for receiving and holding a reticle cassette or reticle holder having a particular configuration, each reticle cassette or reticle holder enclosed respectively within a sealed SMIF pod carrying at least one reticle, the reticle transfer system comprising:

a. at least two SMIF pod openers that are respectively adapted for:

i. receiving a sealed SMIF pod which carries either a reticle cassette or a reticle holder;

ii. opening the SMIF pod thereby exposing either a reticle cassette or a reticle holder carried therein together with a reticle carried thereby to a controlled environment maintained within the reticle transfer system;

b. a robotic arm mechanism which includes an end effector that is adapted for supporting and clamping a reticle, the robotic arm mechanism at various times being positionable within the reticle transfer system adjacent to an opened SMIF pod that is present within either of the pod openers and:

i. for inserting the end effector toward the exposed reticle cassette or reticle holder for supporting and clamping a reticle carried thereby, and to withdraw the reticle from the reticle cassette or reticle holder into the controlled environment maintained within the reticle transfer system; and

ii. for inserting the end effector having a reticle supported by and clamped thereto from the controlled environment maintained within the reticle transfer system toward the exposed reticle cassette or reticle holder to

deposit the reticle in the reticle cassette or reticle holder;

whereby the reticle transfer system effects automatic transfer of reticles through the controlled environment maintained within the reticle transfer system between a pair of reticle cassettes and/or reticle holders; and

c. a box-opening-station reticle reorienter that is adapted for:

i. use in automatically exchanging reticles between a reticle carrier located in the reticle reorienter and a reticle cassette or a reticle holder located in one of the pod openers; and

ii. receiving in the box-opening-station reticle reorienter a reticle-shipping container having:

A. a reticle carrier enclosed therein; and

B. a registration tag for indicating an orientation for the reticle carrier enclosed therein; and

iii. the box-opening-station reticle reorienter including an orientation probe for use in ascertaining the orientation of a reticle-shipping container received therein.

21. (New) The SMIF pods, which pod openers included in the reticle transfer system of claim 20 are adapted to receive, include a cassette-type encoder which carries a unique, machine-readable code for specifying a particular type of reticle cassette or reticle holder that the SMIF pod is adapted to receive and hold,

the reticle transfer system of claim 20 further comprising a reader for ascertaining from the cassette-type encoder which particular type of reticle cassette or reticle holder a SMIF pod carries.

22. (New) Each cassette-type encoder included in SMIF pods, which pod openers included in the reticle transfer system of claim 21 are adapted to receive, include a block of material that is pierced by at least one hole and which is affixed to a base of the SMIF pod, and wherein

the end effector of the reticle transfer system of claim 21 includes a thru-beam sensor which, in ascertaining which particular type of reticle cassette or reticle holder the SMIF pod carries, is adapted for passing a beam of light through holes that pierce the block of material.

23. (New) The reticle transfer system of claim 20 wherein the end effector includes a reticle-presence detector that is

adapted for use in ascertaining a location where the reticle cassette or reticle holder actually carries a reticle.

24. (New) The reticle transfer system of claim 20 wherein the end effector includes:

a reticle-support blade that is secured to, supported by and projects outward from the robotic arm mechanism, and that the robotic arm mechanism, when effecting an automatic transfer of a reticle between a pair of reticle cassettes and/or reticle holders, disposes beneath the reticle; and

a front gripper secured to an end of the reticle-support blade which is furthest from the robotic arm mechanism, and that the robotic arm mechanism, when effecting an automatic transfer of a reticle between a pair of reticle cassettes and/or reticle holders, disposes to receive an edge of the reticle that is located furthest from the robotic arm mechanism.

25. (New) The SMIF pods, which pod openers included in the reticle transfer system of claim 24 are adapted to receive, include a cassette-type encoder formed by a block of material that is pierced by at least one hole to thereby establish a unique, machine-readable code for specifying a particular type of reticle cassette or reticle holder that the SMIF pod is adapted to receive

and hold, the cassette-type encoder being affixed to a base of the SMIF pod, and wherein

the reticle transfer system of claim 24

wherein the front gripper of the end effector is divided into two halves which are respectively secured to the end of the reticle-support blade on opposite sides of a notch that pierces the end of the reticle-support blade furthest from the robotic arm mechanism; and

the end effector further includes a thru-beam sensor which, when the reticle transfer system ascertains which particular type of reticle cassette or reticle holder the SMIF pod carries:

passes a beam of light across the notch that pierces the end of the reticle-support blade furthest from the robotic arm mechanism; and

the robotic arm mechanism positions the end effector so the beam of light may pass through holes that pierce the block of material.

26. (New) The reticle transfer system of claim 24 wherein the end effector further includes a rear gripper that is located on the reticle-support blade between the front gripper and the robotic arm mechanism, the rear gripper being urgeable horizontally along

the reticle-support blade toward the front gripper to engage an edge of the reticle which is furthest from the front gripper when the end effector clamps a reticle thereto.

27. (New) The reticle transfer system of claim 26 wherein the rear gripper of the end effector includes a vacuum port that is adapted for engaging the edge of the reticle which is furthest from the front gripper to form a vacuum chuck therewith which, during withdrawal of the reticle from the reticle cassette or reticle holder into the controlled environment maintained within the reticle transfer system, secures the reticle to the end effector.

28. (New) The reticle transfer system of claim 24 wherein the end effector further includes a pair of moveable side grippers that are located on the reticle-support blade between the front gripper and the robotic arm mechanism, the side gripper being adapted for closing toward each other to respectively engage opposite side edges of the reticle thereby both clamping the reticle to the end effector and restraining the reticle from moving horizontally with respect to the reticle-support blade.

29. (New) The reticle transfer system of claim 20 wherein the reticle reorienter further re-orients reticles between a

vertical orientation of reticles present in a reticle carrier and a horizontal orientation of reticles carried either by a reticle cassette or by a reticle holder located in one of the pod openers.

30. (New) The reticle transfer system of claim 29 wherein the reticle reorienter provides a tilt station which is adapted for directly receiving the reticle carrier after removal from a reticle-shipping container, the tilt station initially receiving the reticle carrier with reticles present therein oriented vertically.

31. (New) The reticle transfer system of claim 20 wherein the box-opening-station reticle reorienter is adapted for directly receiving a reticle-shipping container which includes an outer box in which rests a reticle carrier that receives reticles, the reticle carrier and reticles carried thereby being covered by a box cover which mates with and seals the outer box; the box-opening station being further adapted for removing the box cover to thereby expose both the reticle carrier and reticles carried therein.

32. (New) The reticle transfer system of claim 31 wherein the box-opening station further includes least one box clamp for

locking the outer box and the reticle carrier to the box-opening station while the box cover is removed therefrom.

33. (New) The reticle transfer system of claim 31 wherein the box-opening station further includes a rotary table that receives a reticle-shipping container and is adapted for rotating the reticle-shipping container about an axis that is disposed parallel to reticles carried in the reticle carrier enclosed within the reticle-shipping container.